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Sustainable qualifying criteria for designing circular business models

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Abstract

A successful transition to Circular Economy requires systemic changes in the way companies understand and do business, with sustainability as a strong foundation. Sustainable business model innovation has become fundamental for companies' competitiveness. The design of innovative business models is challenging, especially considering that in some cases the new circular systems may not be more sustainable than the previous ones (e.g.: due to rebound effects). Many different approaches have been proposed for designing either circular or sustainable business models, however there is no consensus of an integrated vision of both concepts. A comprehensive review was performed to identify sustainability characteristics of business models. These were analyzed and translated into sustainable qualifying criteria to be applied when designing circular business models. The aim of the qualifying criteria is serving as a checklist that can inspire the development of circular business models based on best practices for social, environmental and economic systems.

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Keywords: circular economy; sustainability; business model; sustainable criteria

1. Introduction

There is an increasing pressure for the transition towards a more sustainable society. Many governmental organizations, business, and scholars have been calling for a rethink in current linear economic system and industrial practices [1–4]. The concept of a circular economy is viewed as a systemic approach to help addressing sustainability issues. The European Union and China have included the topic in their agendas and are already acting to stimulate circular economy implementation [3,4]. From the business side, the Ellen MacArthur Foundation has been assisting the dissemination of the concept within industries worldwide [5]. However, there is a lot of work still remaining to make the transition happen.

Circular economy is treated by some authors as a concept that aims to promote radical innovation by shifting the whole economic logic, industrial systems, markets and consumption patterns [1,3]. Nevertheless, the ideas within circular economy concept are not new [6,7]. Circular economy's implementation involves several initiatives originated from different previous concepts and fields of knowledge (such as biomimicry, cradle-to-cradle, industrial ecology, performance economy, and others) with the final objective of slowing, narrowing or closing the loop of material and energy flows to promote a regenerative industrial system [1,3,4,6,7]. The aim is reaching and changing different spheres of society, such as single organizations and consumers (micro level), industrial networks or ecosystems (meso level) and cities, provinces or nations (macro-level) [3,8].

From the industrial and market perspectives, a successful transition to circular economy requires systemic changes in the way companies generate value, understand and do business. In this new context, companies are compelled to work closely and interact with an ecosystem of actors and stakeholders, moving from a firm-centric to a systemic or network-centric operational logic [9,10]. This transition towards circular economy requires that established companies rethink and redesign their current business models in a radical disruptive manner [4,9].

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Designing these innovative circular and sustainable business models might be challenging for companies, especially considering that in some cases the new circular systems are not necessarily more sustainable (economically, environmentally and socially superior) than the previous ones, either due to their natural configuration, to rebound effects [3,7,10,11] or to the fact that circular economy approaches are more narrow (apparently emphasizing economic benefits, simplifying the environmental perspective and excluding the social dimension) than sustainability aspects [7]. Due to these reasons, companies should consider sustainability as a stronger foundation in circular business modelling, always having in mind the notion that circular economy is only a conditional or beneficial strategy towards sustainable development, and therefore other complementary sustainability actions may be necessary [7]. This approach requires new knowledge and capabilities that may not be natural to many organizations. Therefore, there is a need to deliberately include management activities, methods and tools to improve sustainability [12,13].

Several different approaches have been proposed for designing either "circular" or "sustainable" business models, however few methods or tools [14,15] try to address the integrated vision of both concepts. Furthermore, they are still experimental, do not approach sustainability holistically, and seem complex to be practically applied by organizations without experts' facilitation. These gaps lead to the research question: *what are the sustainable qualifying criteria for designing circular business models?* Therefore, this study aims to identify "sustainable qualifying criteria" to promote a common language for facilitating the effective development of sustainable circular business models.

After explaining the research methodology (section 2), this article presents an overview of the relation between circular economy and sustainability, and the existing approaches in sustainable business model innovation (section 3). This is followed by the identification and discussion of the "sustainable" qualifying criteria for business modelling in the circular economy context (section 4). Lastly, conclusions and future research steps are outlined (section 5).

2. Research methodology

In order to answer the research question, a comprehensive review of literature was conducted. The process was divided into two steps. First, sustainable business model innovation approaches (conceptual models or design methods and tools) were identified and selected from literature. Then, the approaches were analyzed for the identification of characteristics expected in sustainable business models. These characteristics were synthetized into "sustainable qualifying criteria" to guide the design of circular business models.

2.1. Comprehensive review – identification of sustainable business model innovation approaches

As a first step of the literature review (based on [16]), a search was performed in Web of Science and Scopus academic databases in July 2017. The search string (("circular economy" OR "circle economy" OR circularity OR circle OR circular OR "closed loops" OR "sustainable" OR sustainab*) AND "business models" AND (method OR tool OR framework OR approach OR methodology OR procedure OR technique OR canvas) was applied to topic (title-keywords-abstracts). The search was limited for articles in English that were published after 1950.

After removing duplicates, the authors applied a first filter by scanning titles, keywords and abstracts of these articles. Articles have been regarded as irrelevant if their association with sustainability business model design approaches has been absent (articles addressing only the circularity approach without referring to the broader view of sustainability were disregarded in this review). Then the full content of the pre-selected articles were examined in a second filter. Selected articles in this last filter were in accordance to two criteria: showing at least succinct information about the method or tool and not addressing specific sectors (e.g.: building industry).

After that, a snowballing approach was applied in order to capture established and conceptual trends through cross-references. These articles were also inspected according to the aforementioned sequence of filters and criteria.

Finally, a limited number of influential non peer-reviewed publications from non-profits organizations or knowledge platforms on circular economy developed by international organizations (such as the Ellen MacArthur Foundation; the Circular Economy Practitioner Guide published by the World Business Council for Sustainable Development; and the Knowledge Hub developed by Circle Economy) were also included. This approach was previously applied in circular economy literature such as in Aminoff et al. [9] and Geisdoerfer et al. [7]. According to the aforementioned authors, since circular economy is a new area of research that has not been extensively addressed by peer-reviewed articles, the inclusion of these last articles are not only appropriate but necessary. Furthermore, this approach is in accordance to review methodologies for management and organizational fields [17,18]. Nevertheless, it is important to reinforce that the main focus of the search was concentrated on peer- reviewed scientific journal articles to ensure the quality of the sample.

2.2. Identification and synthesis of the sustainable circular qualifying criteria for business models

In this second step the articles were examined and the main characteristics of sustainable business models pointed out by the authors were identified by applying techniques based on content analysis [19]. After that, inspired by Aminoff et al. [9], these characteristics were synthetized and categorized according to a framework based on a combination of how value is treated in traditional (or profit-oriented) business model innovation [20,21] and in sustainable business model innovation [22,23].

The framework contains five categories. **Value proposition**, representing which and how stakeholders and customers' needs are addressed by the business or network of businesses (in the case of sustainable ecosystems). This includes the description of the needs and the offering or the bundle of products and services applied to address the target needs [20,21,23]. **Value creation**, which addresses how value

is created by the supply chain or how value is co-created in the value network, this last being a differential of the sustainable business model innovation. Value creation encompasses defining and managing the network's resources, processes, partnerships agreements and physical infrastructure [20,21,23]. **Value delivery**, which envisions the customer interface management or the stakeholders interface management in the case of sustainable systems. Value delivery encompasses defining and managing aspects related to the relationship with stakeholders and communication, sales and distribution channels [20,21,23]. **Value capture**, which addresses how value is retained or recovered by businesses by transforming them in results. In the traditional business model innovation, the value capture is represented by the financial model, since results are mainly interpreted as economic profit. Sustainable business model innovation incorporates social and environmental results are along with economic profit, representing value capture by means of triple bottom line results [20,21,23]. And lastly, **value transformation**. This fifth category was added as a necessity to incorporate sustainability characteristics that did not fit in the aforementioned clusters. This per se is a contribution of this work, since it suggests - inspired by [22] - that sustainable business models must build upon traditional concepts and consider a long term transformational perspective as sources of value.

3. Research on Circular Economy and Sustainable Model Innovation

3.1. Sustainability and the Circular Economy

Sustainability is interpreted in this article as "the balanced integration of economic performance, social inclusiveness, and environmental resilience, to the benefit of current and future generations" [7]. Circular Economy is understood as an umbrella concept (a phenomena that creates a relation between pre-existing independent concepts) [6] that aims to develop a regenerative economic system by intentionally slowing, closing, and narrowing material and energy loops [1,7].

The relationship of sustainability and the circular economy is not clear in literature and still calls for theoretical consensus [6]. Nevertheless, some authors [7,24] have already started this discussion. In their review, Geissdoerfer et al. [7] identify similarities, differences and types of relationships between circular economy and sustainability recurrently appearing in literature. According to them, circular economy is interpreted in literature in different ways, being either a requirement for sustainability, a synergetic or beneficial relation, or a trade-off. In an attempt to consolidate the topic, they argue that circular economy is a narrower concept than sustainability, since it emphasizes the economic dimension, sometimes simplifies the environmental dimension, and seems to neglect the social perspective [7]. This study adopts the same point of view from Geissdoerfer et al. [7], as it considers that not all circular business models are necessarily more sustainable.

3.2. Sustainable Business Model Innovation (SBMI)

Sustainable business model innovation integrates sustainability practices into business model innovation. It aims at creating benefits and/or reducing negative impacts for society and/or the environment by changing the way economic value is approached [25].

The literature review identified twenty-one developed approaches to support sustainable business model innovation as listed in Table 1. They comprise conceptual models, methods or tools that are in a large majority either theoretical or still experimental. The conceptual models were mainly developed in between 2008 and 2013, while the majority of methods and tools emerged in the years of 2016 and 2017. This temporal evolution signalizes that this research field is still in a maturing process, currently transitioning from theoretical and conceptual deliberations towards a stage of methodological support development. The natural next steps in a mid-term horizon consist of practical validation and consolidation of concepts and methodologies.

Table 1. Sustainable business model innovation approaches.

Name of the Approach	Reference
Basic normative requirements for sustainable innovations	[23]
Business models' archetypes	[25]
Business models for sustainability	[26]
Collaborative Business Modelling (CBM)	[27]
Conceptual framework of business models for sustainability	[28]
Eco-efficient value creation (EVR benchmarking) and Circular Transition Framework	[15]
Elements contributing to the transformation towards business models for sustainability	[29]
Elements of sustainable business models	[30]
Framework for Sustainable Circular Business Model Innovation	[14]
Framework of using value uncaptured for sustainable business model innovation	[22]
Framework for Strategic Sustainable Development (FSSD)	[31]
Game-based tool for Sustainable Product and Business Model Innovation in the Fuzzy Front End	[32]
Morphological matrix for circular development	[33]
Process for sustainable value proposition design	[34]
Strongly Sustainable Business Model Ontology (SSBMO)	[13]
Sustainable Business Model Canvas	[35]
"Sustainability business model" (SBM)	[36]
Triple layered business model canvas (TLBMC)	[37]
Unified Perspective for Creation of Sustainable Business Models	[38]
Value Mapping Tool	[39,40]
Workshop based tool for improving Value Proposition	[41]

4. Sustainability qualifying criteria for designing circular business models

To answer the research question, twenty-four sustainability criteria for supporting business modelling in circular economy context were identified in the sustainable business model approaches. They are indicated in Tables 2, 3, 4, 5 and 6 according to the value categories.

Table 2. Sustainable qualifying criteria: value proposition category

#	Value Proposition
1	Value propositions are systematically assessed, being not only positive, but also negative or transforming over time. They address needs and how they are satisfied (value created and delivered), left unsatisfied (value destroyed and missed) or potentially satisfied in the future (value opportunities to be captured) [13,22,39–42]
2	Value propositions and opportunities take a life-cycle thinking approach into account, addressing the beginning-of-life, middle-of-life and end-of-life of offerings (products, services or product-service systems) [22,33,37]
3	Value propositions balance economic, environment and social needs [13,14,22,23,26–28,32,36–38,40,41]
4	Value propositions internalize externalities (environmental and social) [38]
5	Value propositions add extra value in comparison to market competition [15]
6	Value propositions aim for radical innovations [27,37]
7	Value proposition combines and integrates knowledge from multiple disciplines [13,32,41]

Table 3. Sustainable qualifying criteria: value creation category

#	Value Creation (Value Network or Value Chain)
8	Co-creation of value is fundamental - value creation is described considering a system or network-centric perspective rather than company centric [13,14,22,27,32,34,36–42]
9	Sustainability leaders or champions promote cultural and structural transformation (e.g.: mindset, corporate culture, organizational processes, intangible investments, human resources policy, and organizational structure) [42,35,36]
10	New governance for decision making in the network is established (collective decision making structures) [13,38]
11	Suppliers engage in sustainable supply chain management (materials cycle) [23]
12	Network enables environmental resources view and tracking in order to assess their availability [13,33]
13	Network aims for using renewable resources and energy, minimizing or eliminating non-recyclable waste and pollution with technological innovations to close the loop, reducing consumption, and repairing environmental damage [31,36]

Table 4. Sustainable qualifying criteria: value delivery category

#	Value Delivery (Stakeholders' interface)
14	Interests and needs of all stakeholders from the network constellation are considered for business delivery [26,34,36–41]
15	Customer interface motivates customers to take responsibility for their consumption (change in mindset) [23]
16	Society and nature are treated as stakeholders [13,31–33,35]

Table 5. Sustainable qualifying criteria: value capture category

#	Value Capture (Triple bottom line results)
17	Triple Bottom Line approach in measuring performance (some authors suggest a TRI-PROFIT - single indicator representing the net sum of cost and revenues as a result of activities of environmental, social and economic contexts) [13,36,38]
18	Economic sustainability is a prerequisite (solutions shall enable economic value capture) [12]
19	Financial model reflects an appropriate distribution of economic costs and benefits among the stakeholders involved in the business model [23]
20	Consideration of environmental and social externalities (positive and negative) in the bottom line [31–33,35]
21	Lower eco-burden (resource depletion and environmental pollution) [15,31]

Table 6. Sustainable qualifying criteria: value transformation category

#	Value Transformation
22	Long term view is fundamental [13,30,32]
23	Consideration of changing social expectations (e.g.: laws, regulations) [13,29,32,36,38]
24	Consideration of changing infrastructure (e.g. transportation system) [29,36,38]

The main ideas from these qualifying criteria are summarized as follows:

- Sustainability requires new sources, types and approaches to address value proposition;
- Value creation is treated in a network scale and not only company centric;
- Value delivery considers all involved stakeholders – including nature and society – not focusing solely on customers;
- Value capture accounts for environmental and social sources beyond the traditional economic one and takes all stakeholders into perspective;
- Value transformation shall be considered to take into consideration the changes that a business model may suffer in order to adapt to external socio-economic or technological transitions (such as legislation, infrastructure) in a long-term period.

5. Conclusions and future work

To answer the research question - *what are the sustainable qualifying criteria for designing circular business models?* – this article identifies twenty-four sustainability qualifying criteria by means of a comprehensive literature review. These criteria were identified based on sustainability best practices integrated in sustainable business model innovation approaches. They can be applied as a checklist to support circular business modelling in different moments and with different purposes such as inspiration for the practitioners in the beginning of the ideation stage, or as a verification step in the end of the ideation to check if the different options of business models generated comply with sustainability best

practices; or as guiding criteria for ranking and selecting the most appropriate business model from a set of alternatives before the detailing and implementation stages. Besides that, other two contributions deserve emphasis: the identification of twenty-one approaches (conceptual models, methods and tools) for sustainable business model innovation, and an indication of the current maturity stage of sustainable business model innovation.

This study complements current research in the meso-level perspective of circular economy by addressing the understanding of theoretical foundations to guide the development of appropriate methodological support towards the circular transition. It emphasizes that managers and companies' networks need to understand the foundations and be supported by appropriate methodological approaches to perform an effective transition towards circular economy while keeping the broader aspects of sustainability in perspective.

The main limitations of this study are related to the methods applied for the literature review. The search in academic databases was followed by snowballing and inclusion of non-peer reviewed materials from renowned institutions, which may generate selection bias. Also, the identified qualifying criteria are conceptual by nature and require validation in practical context. Finally, there is an opportunity for further improving this work by investigating to what extent the approaches recently proposed for circular business modelling (but not explicitly addressing sustainability and therefore not considered in the analysis of this review) comply with the identified sustainable qualifying criteria.

This is a conceptual study that will serve as one of the theoretical foundations for the development of a dynamic tool for sustainable circular business modelling. Hence, future work includes the identification of circular business models' methods and tools, the development of a morphological matrix to support the configuration of circular business models, the investigation of how to integrate the sustainable qualifying criteria with the circular business model morphological matrix, and the proposition of the dynamic tool for sustainable circular business modelling. This tool shall be co-developed and broadly validated by industries.

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